

WHAT IS CLAIMED IS:

1 1. An apparatus for gravimetrically calibrating a multi-channel pipette,
2 comprising
3 a balance (37) with a load receiver (38) configured to support one of a
4 plurality of receptacles (13),
5 a holder device (10) configured to hold the plurality of receptacles (13), said
6 receptacles being seated in the holder device (10) at defined equal intervals from each
7 other and arranged so that the receptacles can be filled with a test liquid from pipette
8 tips of the multi-channel pipette,
9 a transport device (1) for transporting the holder device (10) to the load
10 receiver (38),
11 wherein the transport device (1) has means whereby one after another of said
12 receptacles (13) can be placed on and subsequently removed from the load receiver
13 (38)
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1 2. The apparatus of claim 1, wherein at least one of the transport device (1)
2 and the holder device (10) has means for precisely positioning the receptacles (13) on
3 the load receiver (38).
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1 3. The apparatus of claim 1, wherein the transport device (1) is encased in a
2 housing (2), the balance (37) is installed in the housing (2), and the load receiver (38)
3 is arranged on top of the balance and passes upward through an opening (40) of the
4 housing (2) into the holder device (10), when the latter is in a working position on
5 the transport device (1).
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1 4. The apparatus of claim 1 wherein the load receiver (38) has two wings
2 (39) with V-shaped depressions (41) formed at upper ends of the wings (39), from
3 which said one of the plurality of receptacles (13) can be suspended.
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1 5. The apparatus of claim 1, wherein the defined equal intervals correspond
2 to a tip interval at which the tips of the multi-channel pipette are spaced from each
3 other.
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1 6. The apparatus of claim 1, wherein the plurality of receptacles (13) in the
2 holder device (10) has at least as many receptacles (13) as the multi-channel pipette
3 has pipette tips.
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1 7. The apparatus of claim 1, wherein the receptacles (13) have a cross-
2 section of one of the geometric shapes known as circles, ovals and rectangles.
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1 8. The apparatus of claim 1, wherein the holder device (10) comprises a
2 holder rack (16) with indentations (18) in which the receptacles (13) are seated by
3 means of rigid suspension members (19, 19') that are attached to upper ends of the
4 receptacles (13).
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1 9. The apparatus of claim 8, wherein the rigid suspension members (19,
2 19') comprise sockets that partially surround a circumference of the receptacle (13),
3 and rod members (24, 24') with an inner cone (25) and an outer cone (26).
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1 10. The apparatus of claim 9, wherein at least one of the rod members (24,
2 24') further has a double cone (27) consisting of two cones pointing in opposite
3 directions, located between the inner cone (25) and the outer cone (26), and forming
4 a ring groove (28) at a transition from the double cone (27) to the outer cone (26),
5 said ring groove (28) serving to positively seat the suspension member (19) in one of
6 the indentations (18) of the holder rack (16).

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1 11. The apparatus of claim 1, wherein the holder device (10) is separable
2 from the transport device (1).

1 12. The apparatus of claim 1, wherein the holder device (10) has a cover
2 (9) as a barrier against contamination and evaporation.
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1 13. The apparatus of claim 1, wherein the holder device (10) has at least
2 one tub (15) near openings of the receptacles (13), wherein the tub (15) can be filled
3 with the test liquid to create a saturated atmosphere in the holder device (10) and
4 thereby reduce evaporation of the test liquid from the receptacles (13).
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1 14. The apparatus of claim 1, wherein the holder device (10) has means
2 whereby an underside of the holder device (10) is sealed when the holder device (10)
3 is set on a flat surface.
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1 15. The apparatus of claim 1, wherein the transport device (1) is operable to
2 move the holder device (10) horizontally back and forth while at the same time

3 raising and lowering the holder device (10).

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1 16. The apparatus of claim 15, wherein the transport device (1) is
2 configured to perform said back and forth movements with simultaneous raising and
3 lowering with a single drive source.

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1 17. The apparatus of claim 16, wherein the single drive source is an electric
2 motor.

1 18. The apparatus of claim 1, wherein the transport device (1) has a
2 transport carriage (8) and a transport channel (5) in which the transport carriage (8)
3 moves, and wherein the transport carriage (8) has a seat (12) for the holder device
4 (10).

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1 19. The apparatus of claim 1, wherein the transport device (1) comprises at
2 least one transport rack (7) guiding said movements of the holder device (10).

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1 20. The apparatus of claim 1, wherein the transport device (1) comprises a
2 position sensor operable to determine an actual position of one of the holder device
3 (10) and the transport carriage (8) in relation to the transport device (1).

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1 21. The apparatus of claim 16, comprising a drive mechanism (35), a
2 housing (2), a drive wheel (51) with at least two bolts (52), and a drive rack (36)
3 with arcuate cutouts, wherein the drive mechanism (35) with the drive wheel (51) is
4 attached to the housing (2), the drive rack (36) is attached to one of the transport
5 carriage (8) and the holder device (10) and the bolts (52) are configured to engage

1 the arcuate cutouts of the drive rack (36).

1 22. The apparatus of claim 21, wherein the drive rack (36), the transport
2 rack (7), and the holder rack (16) are shaped with a common periodic pitch.

1 23. The apparatus of claim 1, wherein the holder device (10) is guided by
2 the transport device (1) along a linear travel path.

1 24. The apparatus of claim 1, wherein the holder device (10) is guided by
2 the transport device (1) along a circular travel path.

1 25. The apparatus of claim 1, wherein each receptacle (13) has a bottom
2 surface (62) marked with a receptacle code (46), and the transport device (1) has a
3 sensor head (47), and wherein signal-conducting means (48) are provided for
4 transmitting a code signal from the receptacle code (46) to the sensor head (47).

1 26. The apparatus of claim 1, wherein the holder device (10) is marked with
2 a holder device code (49) and the transport device (1) comprises a sensor device (50)
3 that is operable to read the holder device code (49) and is arranged at an even level
4 with the holder device code.

1 27. A transport device (1) operable to transport a plurality of receptacles
2 (13) containing a pourable substance to a measuring device, wherein:
3 - the transport device (1) comprises a holder device (10) in which the

4 receptacles (13) are seated so that they center themselves and can be individually
5 handled;

6 - the holder device (10) is configured for being transported in the
7 transport device (10);

8 - the holder device (10) comprises means for damping a movement of
9 the receptacles (13) if they are displaced from an equilibrium position by an
10 extraneous influence;

11 - the transport device (1) comprises means whereby one after another of
12 the receptacles (13) can be delivered to and subsequently removed from the
13 measuring device in a manner, where the removal of one receptacle (13) and the
14 delivery of a next following receptacle (13) occur simultaneously.

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1 28. The transport device of claim 27, wherein the receptacles (13) are
2 seated in the holder device (10) at equally spaced positions with a defined distance
3 from each other.
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1 29. The apparatus of claim 27, wherein the measuring receptacles (13) have
2 a cross-section of one of the geometric shapes known as circles, ovals and rectangles.
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1 30. The apparatus of claim 27, wherein the holder device (10) comprises a
2 holder rack (16) with indentations (18) in which the receptacles (13) are seated by
3 means of rigid suspension members (19, 19') that are attached to upper ends of the
4 receptacles (13).
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1 31. The apparatus of claim 30, wherein the rigid suspension members (19,
2 19') comprise sockets that partially surround a circumference of the receptacle (13),
3 and rod members (24, 24') with an inner cone (25) and an outer cone (26).
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5 32. The apparatus of claim 31, wherein at least one of the rod members
6 (24, 24') further has a double cone (27) consisting of two cones pointing in opposite
7 directions, located between the inner cone (25) and the outer cone (26), and forming
8 a ring groove (28) at a transition from the double cone (27) to the outer cone (26),
9 said ring groove (28) serving to positively seat the suspension member (19) in one of
1 the indentations (18) of the holder rack (16).
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1 33. The apparatus of claim 27, wherein the holder device (10) is separable
2 from the transport device (1).
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1 34. The apparatus of claim 27, wherein the holder device (10) has a cover
2 (9) as a barrier against contamination and evaporation.
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1 35. The apparatus of claim 27, wherein the holder device (10) has at least
2 one tub (15) near openings of the receptacles (13), wherein the tub (15) can be filled
3 with the test liquid to create a saturated atmosphere in the holder device (10) and
4 thereby reduce evaporation of the test liquid from the receptacles (13).
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1 36. The apparatus of claim 27, wherein the holder device (10) has means

2 whereby an underside of the holder device (10) is sealed when the holder device (10)
3 is set on a flat surface.
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1 37. The apparatus of claim 27, wherein the transport device (1) is operable
2 to move the holder device (10) horizontally back and forth while at the same time
3 raising and lowering the holder device (10).
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1 38. The apparatus of claim 37, wherein the transport device (1) is
2 configured to perform said back and forth movements with simultaneous raising and
3 lowering with a single drive source.
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1 39. The apparatus of claim 38, wherein the single drive source is an electric
2 motor.
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1 40. The apparatus of claim 27, wherein the transport device (1) has a
2 transport carriage (8) and a transport channel (5) in which the transport carriage (8)
3 moves, and wherein the transport carriage (8) has a seat (12) for the holder device
4 (10).
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1 41. The apparatus of claim 27, wherein the transport device (1) comprises
2 at least one transport rack (7) guiding said movements of the transport receptacle
3 (10).
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1 42. The apparatus of claim 27, wherein the transport device (1) comprises a
2 position sensor operable to determine an actual position of one of the holder device
3 (10) and the transport carriage (8) in relation to the transport device (1).
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1 43. The apparatus of claim 38, comprising a drive mechanism (35), a
2 housing (2), a drive wheel (51) with at least two bolts (52), and a drive rack (36)
3 with arcuate cutouts, wherein the drive mechanism (35) with the drive wheel (51) is
4 attached to the housing (2), the drive rack (36) is attached to one of the transport
5 carriage (8) and the holder device (10) and the bolts (52) are configured to engage
1 the arcuate cutouts of the drive rack (36).

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2 44. The apparatus of claim 43, wherein the drive rack (36), the transport
3 rack (7), and the holder rack (16) are shaped with a common periodic pitch.

1 45. The apparatus of claim 27, wherein the holder device (10) is guided by
2 the transport device (1) along a linear travel path.

1 46. The apparatus of claim 27, wherein the holder device (10) is guided by
2 the transport device (1) along a circular travel path.

1 47. The apparatus of claim 27, wherein each receptacle (13) has a bottom
2 surface (62) marked with a receptacle code (46), and the transport device (1) has a
3 sensor head (47), and wherein signal-conducting means (48) are provided for
4 transmitting a code signal from the receptacle code (46) to the sensor head (47).

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1 48. The apparatus of claim 27, wherein the holder device (10) is marked
2 with a holder device code (49) and the transport device (1) comprises a sensor device
3 (50) that is operable to read the holder device code (49) and is arranged at an even

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4 level with the holder device code.

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